K.4
ND
170084

Geomembrane (HDPE) Liner Specifications

Technical Specification Section 02091 -
Wastewater Storage Pad (Revised)

DIVISION 2 - SITE WORK

SECTION 02091 - WASTEWATER STORAGE PAD

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall be responsible for construction, operation, and temporary closure of the wastewater storage pad meeting the requirements of these Specifications and Drawings. The wastewater storage pad shall be used as a secondary containment area for wastewater storage tanker trucks which shall be used for storage of collected decontamination waters and any other contaminated liquids generated or staged for disposal.

1.02 RELATED SECTIONS

A. The Contractor's particular attention is directed to the following sections related to wastewater storage pad construction:

1. Section 01050 - FIELD ENGINEERING AND SURVEYING.

2. Section 02200 - EARTHWORK.

3. Section 02280 - GEOTEXTILES.

PART 2 - PRODUCTS

2.01 HDPE GEOMEMBRANES

A. HDPE geomembranes shall be manufactured of new, first-quality products, and designed and manufactured specifically for the intended purpose.

B. The resin used in manufacturing the HDPE shall meet the following minimum requirements:

Density	ASTM D1505	$\geq$0.94 g/cc
Specific Gravity	ASTM D792 Method A or ASTM D1505	$\geq$.9835
Melt Flow Index	ASTM D1238 Condition E	<0.3 g/10 min

C. Reclaimed polymer shall not be added to the resin.

D. HDPE geomembranes shall meet the following minimum requirements.

Sheet Thickness	Continuous physical or ASTM D751	60 mils ±10 percent
Tensile strength at yield	ASTM D638 Type IV	140 lb/in-width
Tensile strength at break	ASTM 638 Type IV	240 lb/in-width
Elongation at yield	ASTM D638 Type IV	<20 percent
Elongation at break	ASTM D638 Type IV	700 percent
Modulus of elasticity	ASTM D638	80,000 psi
Tear resistance	ASTM D1004 Die C	45 lb
Puncture resistance	FTMS 101B/2065	105 lb
Resistance to soil burial elongation at break	ASTM D3083 using ASTM D638 Type IV Dumbbell at 2 ipm	±1 percent
Dimensional stability (each direction)	ASTM D1204 212 degrees F, 15 minutes	±1 percent
Environmental stress crack resistance	ASTM D1693	0 failures in 1,500 hrs
Low temperature brittleness	ASTM D746 Procedure B	-40 degrees F
Carbon black content	ASTM D1603	2 to 3 percent
Carbon black dispersion rating	ASTM D3015	A-1

E. Liners shall consist of an HDPE sheet containing a maximum of 3 percent by weight of additives, fillers, or extenders with carbon black for ultraviolet resistance.

F. The liner material shall be so produced as to be free of holes, blisters, undispersed raw materials, or any sign of contamination of foreign matter. Any such defect shall be repaired using the extrusion or fusion welding technique in accordance with the manufacturer's recommendations.

G. Geomembrane shall be supplied in prefabricated panels or blankets or in rolls from one manufacturer.

H. Geomembrane shall meet the following specifications for resistance to soil burial:

Resistance to Soil Burial. Percent change in original value. (Typical) Tensile Strength at Break and Yield	ASTM D3083 using ASTM D638 Type IV Dumb-bell at 2 ipm. % Change	±10
Elongation at Break and Yield	% Change	±10

2.02 AGGREGATE

A. The aggregate material placed over geotextile and HDPE liner shall be Indiana Department of Highways (IDOH) Material Number 53. The aggregate shall have a gradation and quality equal to IDOH No. 53 as defined in the standard specifications.

2.03 GEOTEXTILES

A. The geotextile used for the wastewater storage pad shall meet the requirements of Section 02280 - GEOTEXTILES.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor shall be responsible for layout of the wastewater storage pad as shown on the Drawings including lines slopes and grades.

B. The Contractor will proof roll the subgrade a minimum of three passes with a smooth drum vibratory compactor with a total dynamic force of not less then 7,000 pounds.

C. The Contractor is responsible for the HDPE geomembrane procurement, transportation, storage, handling, testing, and installation. Any damaged or unacceptable material shall be replaced at no additional cost to the ECC Trust. Geomembrane liner shall be protected during storage to prevent material

degradation. Handling is to be done in a manner that will prevent any damage to the material.

D. Contractor will certify to the Engineer in writing that the subgrade on which the geomembrane liner will be installed is acceptable. Those areas where the surface is unsatisfactory for geomembrane liner placement shall be corrected by the Contractor until acceptable. During liner installation, the soil surface will be maintained in such a manner as to preserve the surface condition. Any damage to the subgrade caused by liner installation or erosion shall be repaired at no cost to the ECC Trust.

E. Geomembrane shall not be placed in areas that have become softened by precipitation as determined by hand penetrometer (i.e., a penetrometer reading of less than 1.0 tsf).

F. Prior to geomembrane placement, the anchor trench shall be excavated to 2 feet below existing grade.

G. The anchor trench shall be backfilled and compacted with hand-operated equipment.

H. Care shall be taken when backfilling the trenches to prevent any damage to the geomembrane.

I. Geomembrane liner placement shall not proceed at an ambient temperature below 5 degrees C (40 degrees F) or above 40 degrees C (104 degrees F), during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in an area of ponded water, or in the presence of excessive winds that might affect proper placement

Liner placement shall follow these guidelines:

1. Equipment used shall not damage the geomembrane by any means.

2. Personnel working on the geomembrane shall not smoke, wear damaging shoes, or engage in other activities that could damage the geomembrane.

3. The method used to unroll the panels shall not cause scratches or crimps in the geomembrane and shall not damage the supporting soil.

4. The method used to place the panels shall minimize wrinkles.

5. Sand bags shall be placed to prevent the geomembrane from being uplifted by wind. In case of high winds, continuous loading is recommended along the edges of panels to minimize risk of wind flow under panels.

6. The geomembrane in high traffic areas shall be protected by geotextiles, extra geomembrane, or other materials.

J. Any panel or portion thereof that, in the judgement of the Engineer, becomes seriously damaged (i.e., torn or twisted permanently) shall be replaced by the Contractor at no additional cost to the ECC Trust.

K. Seams shall be oriented longitudinally with the slopes (i.e., positioned up and down slopes).

L. Overlapping and temporary bonding requirements are as follows:

1. The panels of HDPE geomembrane shall be overlapped by a minimum of 3 inches for extrusion welding or 5 inches for fusion welding.

2. The procedure used to temporarily bond adjacent panels together shall not damage the geomembrane; the temperature of any spot welding apparatus shall be controlled such that the geomembrane is not damaged.

M. Seams shall be prepared in accordance with the following requirements.

1. Prior to seaming, the seam area shall be clean and free of moisture, dust, dirt, and foreign material.

2. If seam overlap grinding is required, the process shall be completed according to the manufacturer's instructions and in a way that does not damage the geomembranes.

N. Approved processes for field seaming are extrusion welding and fusion welding. Only apparatuses that have been specifically approved by the Engineer (by make and model) shall be used. Welding process requirements are as follows:

1. Extrusion Process:

   a. The welding apparatus shall be equipped with gauges that indicate the temperature in the apparatus and at the nozzle.

   b. Contractor will maintain one spare operable seaming apparatus onsite.

   c. The extruder shall be purged prior to beginning a seam until all heat degraded extrudate has been removed from the barrel.

2. Fusion Process:

   a. The fusion welding apparatuses shall be automated, vehicular-mounted devices that produce a double seam with an enclosed space.

   b. The fusion welding apparatus shall be equipped with gages that indicate its temperatures and pressures.

   c. Contractor will maintain one spare operable seaming apparatus onsite.

   d. A firm support directly under the seam overlap will be provided.

   e. A movable protective layer will be used directly below each overlap of geomembrane that is to be seamed to prevent buildup of moisture between the sheets.

O. Field seaming shall be conducted within the following weather condition requirements:

1. Unless authorized in writing, no seaming shall be attempted below 5 degrees C (40 degrees F) or above 40 degrees C (104 degrees F).

2. Between 5 degrees C (40 degrees F) and 10 degrees C (50 degrees F), seaming shall be possible with controlled cooling if the geomembrane is preheated.

3. Above 10 degrees C (50 degrees F), no preheating shall be required.

No "fish mouths" shall be allowed within the seam area. Where "fish mouths" occur, the material shall be cut, overlapped, and an overlap fusion weld shall be applied. All welds on completion of the work shall be tightly bonded. Any membrane area showing injury caused by excessive scuffing, puncture, or distress for any cause shall be replaced or patched.

P. Contractor will retain all ownership and responsibility for the geomembrane until accepted by the Engineer.

Q. During backfill over the geotextile and geomembrane, the following considerations shall be compiled with:

1. Placement of IDOH No. 53 - Aggregate fill on the geotextile and geomembrane shall not proceed at an ambient temperature below 5 degrees C (40 degrees F) or in a manner such that geotextile or geomembrane damage is likely.

2. Equipment used for placing shall not be driven directly on the geomembrane or the protective geotextile.

3.02 HDPE LINER REPAIRS

A. Repair Procedures:

1. Tears or pinholes, blisters, large holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches or seaming as determined by the Engineer.

2. Surfaces of HDPE that are to be patched shall be prepared to manufacturer's specifications.

3. Patches shall be round or oval in shape, made of the same geomembrane, and extended a minimum of 4 inches beyond the edge of defect or repair.

4. Patches shall be applied using approved seaming methods.

B. Seam Reconstruction Procedures:

1. Seam reconstruction for the extrusion welding process shall be achieved by grinding the existing seam and rewelding a new seam.

2. Seam reconstruction for the fusion process shall be achieved by cutting out the existing seam and welding in a replacement strip.

3.03 HDPE SUMP AND COLLECTION PIPES

A. The prefabricated HDPE sump shall be constructed with a minimum 3/8 inch thick walls and base.

B. Joints in the sump and between the sump and HDPE collection pipe shall be extrusion welded and constructed as directed by the manufacturer.

C. 4 inch perforated HDPE pipe shall have a standard dimensional ratio of 17. Perforations shall be 1/2 inch diameter at 45° from the vertical and be spaced 6 inches on center.

3.04 AGGREGATE

A. IDOH No. 53 aggregate shall be placed over the geotextile and geomembrane to a thickness of 12 inches or as shown on the Drawings.

3.05 OPERATION

A. The Contractor shall be responsible for keeping the wastewater storage pad cleaned as required.

B. The Contractor shall also be responsible for pumping out any accumulation in the HDPE sump as required into the wastewater storage tanker truck located on the wastewater storage pad.

3.06 TEMPORARY CLOSURE

A. At the completion of work activities associated with this Contract, the Contractor shall perform temporary closure of the wastewater storage pad by removing all water from the sump. This water shall be pumped into the wastewater storage tanker truck.

END OF SECTION